



Superfund Record of Decision:

Atchison/Santa Fe/Clovis, NM

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REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R06-88/039		2.		3. Recipient's Accession No. PB89 182505/AS	
4. Title and Subtitle SUPERFUND RECORD OF DECISION Atchison/Santa Fe (Clovis), NM First Remedial Action - Final						5. Report Date 09/23/88	
						6.	
Author(s)						8. Performing Organization Rept. No.	
9. Performing Organization Name and Address						10. Project/Task/Work Unit No.	
						11. Contract(C) or Grant(G) No. (C) (G)	
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460						13. Type of Report & Period Covered 800/000	
						14.	
15. Supplementary Notes							
16. Abstract (Limit: 200 words) The Atchison/Santa Fe (Clovis) Superfund site is located just south of the Atchison, Topeka and Santa Fe (ATSF) Railway switching yard in Clovis, New Mexico. The site is comprised of an approximately 26-acre playa lake (Santa Fe Lake) which has been owned by ATSF since the early 1900s. The surrounding area is mostly industrial, and the lake is currently fenced off to public access. The lake was used for the disposal of wastewater from various operations throughout the years. Wastewater from the washing of hopper cars used for hauling potash, cement, fertilizer, grain, and coke were disposed in the lake from 1962 to 1982. EPA and ATSF reached an agreement under an Administrative Order on Consent for ATSF to conduct an investigation of the lake area. The investigation included sampling of the lake water, the sediments at the bottom of the lake, the soils between the lake bottom and the water table, and the ground water underlying the lake. The major concern at this site is the potential threat to ground water. The aquifer that extends under the lake is the source of drinking water for the City of Clovis. Although contamination of the ground water does not pose a current threat to the city water supply, it does indicate that migration of contaminants from the lake is possible if the source of contamination is not removed. The primary contaminants of concern affecting the sediments, soil, surface water, and ground water are metals including arsenic, chromium and lead, organics including phenols and inorganics. (See Attached Sheet)							
17. Document Analysis a. Descriptors Record of Decision Atchison/Santa Fe (Clovis), NM First Remedial Action - Final Contaminated Media: gw, sediments, soil, sw Key Contaminants: metals (arsenic, chromium, lead), organics (phenols) b. Identifiers/Open-Ended Terms c. COSATI Field/Group							
18. Availability Statement				19. Security Class (This Report) None		21. No. of Pages 36	
				20. Security Class (This Page) None		22. Price	

EPA/ROD/R06-88/039

Atchison/Santa Fe (Clovis), NM
First Remedial Action - Final

16. ABSTRACT (continued)

The selected remedial action for this site includes: construction of a run-on control dike and ditch system; evaporation of the water in Santa Fe Lake through a pump and spray sprinkler system; excavation and onsite treatment of the lake sediments through biodegradation; in situ biodegradation of contaminated soil followed by excavation and placement in the land treatment area; capping the land treatment area with a PVC liner and vegetated soil layer; grading and revegetation of the disturbed area; access restrictions; and ground water and land treatment area monitoring. Additional action may be taken to remediate ground water contamination if subsequent monitoring results indicate the need for action. The estimated present worth cost for this remedial action is \$2,840,000.

ATSF (CLOVIS) SUPERFUND SITE
RECORD OF DECISION
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION SIX

SEPTEMBER 1988



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VI
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

ATSF (Clovis) site, Clovis, New Mexico

STATEMENT OF PURPOSE

This decision document outlines the selected remedial action for the ATSF (Clovis) site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); and the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

The State of New Mexico (through the New Mexico Environmental Improvement Division) has been provided with notice and an opportunity to review and comment on the remedial investigation and feasibility study, along with EPA's proposed plan for remedial action, including without limitation, the technology and degree of treatment therein. The response from the New Mexico Environmental Improvement Division can be found in Attachment 1 of the accompanying Summary of Remedial Alternative Selection.

STATEMENT OF BASIS

This decision is based on the administrative record for the ATSF (Clovis) Superfund site. The index of the administrative record found in Attachment 2 of the Summary of Remedial Alternative Selection identifies the items which comprise the administrative record.

DESCRIPTION OF THE REMEDY

Upon review of the information contained in the administrative record, it is EPA's judgement that evaporation of the water in Santa Fe Lake, the treatment of the residue of that evaporation and of the lake sediments through biodegradation in an onsite treatment area outside the lake bed, the in situ treatment of soils underneath the lake sediments, and the subsequent removal of the treated soils to the treatment area where it and the treated sediments would be capped in the treatment area appears to meet statutory requirements and to best serve the selection criteria and appropriate guidance in relation to the other solutions evaluated. The selected remedy would also include monitoring of the treatment area

and of groundwater under the site during remediation with additional monitoring and maintenance of the treatment area after closure and annual groundwater monitoring. A more detailed description of the remedy and an explanation of how it meets statutory requirements is contained in the "Summary of Remedial Alternative Selection" which follows this Declaration. The remedial action will be reviewed every five years after its initiation to assure that human health and the environment are being protected by the remedial action being implemented.

DECLARATION

The remedy described above is protective of human health and the environment, attains applicable or relevant and appropriate Federal and State requirements and is cost-effective compared to the other alternatives examined. This remedy satisfies the preference for treatment that reduces toxicity, mobility or volume as a principle element. Finally, it has been determined that this remedy utilizes permanent solutions and alternative technologies to the maximum extent practicable.

The State of New Mexico has been consulted on the selection of remedy for the ATSF (Clovis) site and the concurrence of the New Mexico Environmental Improvement Division has been received.

September 23, 1988

Date

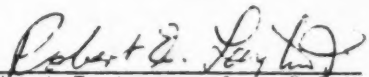

Robert E. Layton Jr., P.E.,
Regional Administrator

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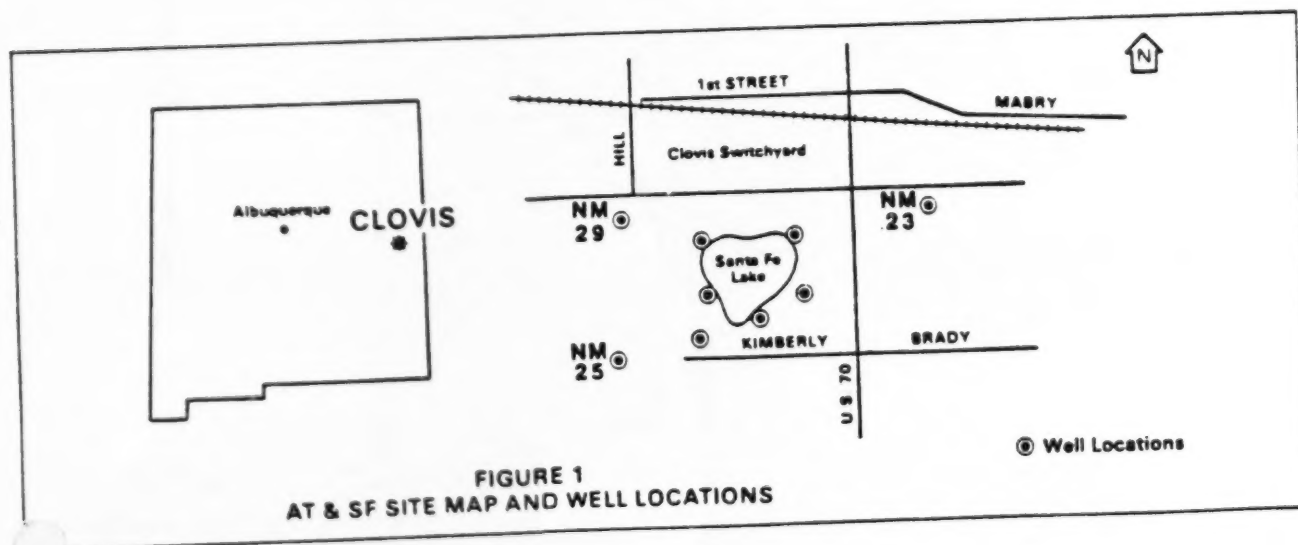
ATTACHMENT ONE	STATE OF NEW MEXICO CONCURRENCE
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ATTACHMENT THREE	RESPONSIVENESS SUMMARY

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

ATSF (Clovis), Clovis, New Mexico

Site Location and Description

The ATSF (Clovis) Superfund site is located just south of the Atchison, Topeka and Santa Fe Railway switching yard in Clovis, New Mexico. As Figure 1 below shows, Santa Fe Lake, the focus of the site, is located between Brady and Kimberly roads. Santa Fe Lake is a playa lake that was used for the disposal of wastewater from various operations at the switching yard. Playa lakes are natural depressions common on the Southern High Plains. These depressions are usually shallow, and serve as drainage collection points in the flat topography of the area. They are characterized by a layer of low permeability clay on the lake bottom, and water of poor quality due to evaporation of the trapped lake water. Santa Fe Lake was used for this purpose from the time of the construction of the switching yard in the early 1900s, though the types of material discharged into the lake have changed through the years. In 1962 a railway hopper car washing facility was built at the switching yard. The hopper cars were used for the hauling of bulk materials such as potash, cement, fertilizer, grain, and coke. The cars were cleaned at the switching yard and the wastewater from this operation was discharged into the lake. The hopper car washing operation continued until 1982 when it was closed. Concern about the lake is concentrated in four areas: the lake water, the sediments that have settled to the bottom of the lake, the soils between the lake bottom and the water table, and the groundwater that lies under the lake.



Current Site Status and Site Risks

This site was proposed for the National Priorities List (NPL) in November 1981. Following the NPL listing and an extensive period of negotiations, EPA and the Atchison, Topeka and Santa Fe Railway (ATSF) reached an agreement under an Administrative Order for ATSF to conduct an investigation of the lake area and to develop alternatives for correcting any problems discovered. The investigation included sampling of the lake water, sampling of the lake sediments, borings beneath the lake bed to get soil samples, and the installation and sampling of monitoring wells to sample the area groundwater. Figure 2 shows the locations in the sampling effort. In addition to the samples taken above, samples were taken to determine what the natural conditions in the area were. These "background samples" included the sampling of water wells owned by the City of Clovis, sampling of other area playa lakes, and borings outside the lake area to get clean soil samples.

The results of the lake sampling are shown in Table 1. As the table shows, when the water in Santa Fe Lake is compared to that in other playa lakes in the area, the Santa Fe Lake water contains elevated amounts of the following: arsenic, boron, chloride, fluoride, total phenolics, sulfate, total dissolved solids (TDS), and total organic carbon (TOC).

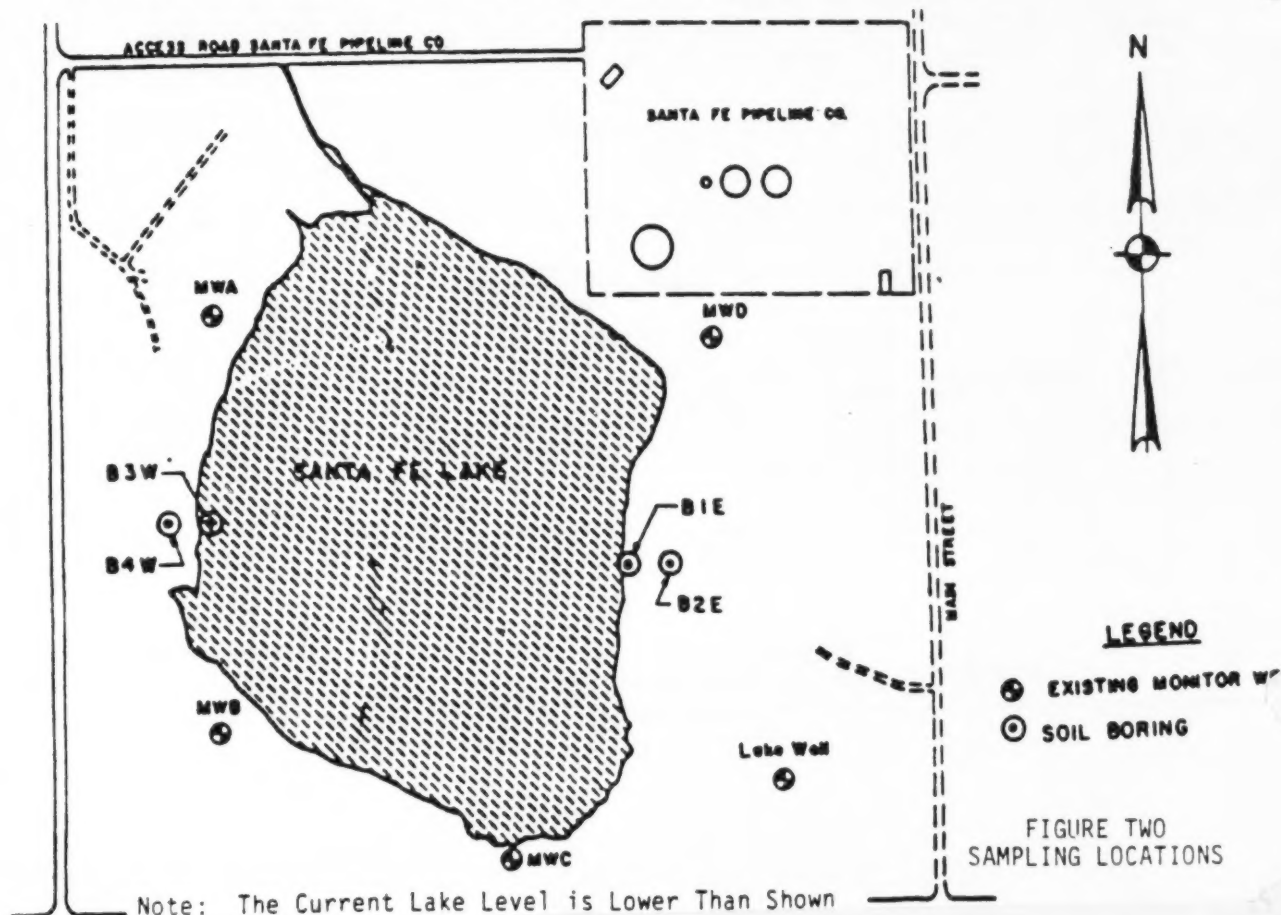


FIGURE TWO
SAMPLING LOCATIONS

TABLE ONE

ANALYTICAL RESULTS FOR PLAYA LAKES

LAKE SAMPLED (mg/l)	PL-1	PL-2	PL-3	HIGH	MEAN	SANTA FE LAKE
Arsenic	0.003	0.002	<0.002	0.003	0.002	<0.4
Barium	0.13	0.12	<0.038	0.13	0.096	0.41
*Boron	<0.6	<0.6	<0.6	0.6	0.6	530
Cadmium	<0.003	<0.003	<0.003	0.003	0.003	0.018
*Chloride	16	7	130	130	51	2,200
Chromium	0.015	0.021	0.018	0.021	0.018	0.059
Cyanide	ND	ND	ND	ND	ND	ND
*Fluoride	4.6	0.5	1.8	4.6	2.3	44.0
Hydrocarbons	<0.2	<0.2	<0.2	0.2	0.2	0.2
Lead	<0.05	<0.05	<0.05	0.05	0.05	0.14
Mercury	ND	ND	ND	ND	ND	ND
Nitrate	0.038	1.6	4.7	4.7	2.2	<0.1
pH	8.4	7.8	8.1	8.4	8.1	9.0
* Total Phenolics	<0.005	<0.005	<0.005	0.005	0.005	0.088
Selenium	<0.003	<0.003	<0.012	0.012	0.006	<0.48
Silver	<0.009	0.020	0.021	0.021	0.017	0.027
*Sulfate	130	10	74	130	71	5,630
*TDS	350	270	710	710	443	57,000
*TOC	4	7	20	20	10	510

* Chemical was selected as a contaminant of concern for surface water.

The sample results for the lake sediments are presented in Table 2. The levels of boron, lead, chromium, hydrocarbons, total phenolics, and total organic carbon were high enough to warrant closer examination. An EP Toxicity test was run on the sediment samples. The results showed that the resulting levels of metals were below the toxicity standards. The results of the soil sampling effort are presented in Table 3. As the comparison between the background soil samples and the soils from under the lake bed shows, hydrocarbon and total phenolics are elevated. Four other chemicals are also of some concern. These are sulfate, chloride, boron and barium. Finally, Table 4 presents the groundwater sampling results. Looking at the levels of chemicals detected in the wells near the lake as compared to those found in the uncontaminated City water wells, only chloride is significantly above background levels, in monitoring wells B and C. The chloride levels exceed the 250 mg/liter standard for chloride, measuring 265 and 430 mg/liter. While these chloride levels pose no health threat, they may be an indicator of potential contaminant movement from the lake into the underlying groundwater.

The major concern with this site is the potential threat to the groundwater. The groundwater aquifer that extends under the lake is the source for the drinking water for the City of Clovis. An examination of the results shown in Table 4 indicates that contamination in the groundwater under the lake does not pose a current threat to the City water supply, but may pose a future threat if the source of contamination is not eliminated. This is shown by comparing the sample results from upgradient monitoring well MWA to those of downgradient well MWC. Levels of fluoride, boron and chromium, contaminants found at elevated levels in the lake water, do not increase in MWC. One contaminant that did increase as the groundwater passed under the lake was chloride. While the level of chloride found in MWC does not pose a threat to the public, it does indicate that migration of contaminants from the lake is possible. The need, therefore, is to eliminate the source of possible future contamination by eliminating the lake water, soils and sediments as a source of potential contamination. The other potential ways in which the public could be exposed to the contamination in the lake are direct contact with contaminated materials, ingestion of the lake water, ingestion of the lake soils and sediments, or inhalation of contaminants. The lake and surrounding property is owned by ATSF. The lake area is fenced and there is no public access. The lake is not used for any recreational use nor is the lake water consumed by either people or livestock due to its poor quality. Direct contact is, for all of these reasons, very improbable. The lake level is falling and a portion of the lake bed is exposed to air as a result. This does increase the risk from inhalation of dust produced from exposed sediments. As a worst-case scenario for production of dust, it was assumed that the lake would dry up completely exposing all of the sediments. Using this assumption, a risk of 1×10^{-5} from dust inhalation was found. Should no remediation be performed, additional risk based on future migration of contaminants cannot be estimated with accuracy, but some probability of migration and associated risk will remain so long as the lake water, lake sediments and the underlying soils remain as potential contaminant sources.

TABLE TWO

ANALYTICAL RESULTS FROM LAKE SEDIMENT SAMPLES

	TOTAL ANALYSIS (ug/g)		EP TOX (ug/ml)	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
ARSENIC	2.5	2.1	0.01	0.007
BARIUM	180	93	0.97	0.74
BORON	340	300	0.9	0.46
CADMIUM	0.9	0.46	<0.003	<0.003
CHLORIDE	9,600	8,440		
CHROMIUM	190	108	0.043	0.035
CYANIDE	ND	ND		
FLUORIDE	45	41		
HYDROCARBONS	35,000	20,140		
LEAD	89	59.2	0.40	0.24
MERCURY	0.10	0.092	0.0004	0.0004
NITRATE	<90	75		
TOTAL PHENOLICS	<1.1	0.97		
SELENIUM	<1.2	0.48	0.024	0.009
SILVER	1.6	1.02	0.019	0.015
SODIUM	2,000	1,880		
SULFATE	6,900	4,760		
% TOC	13.5%	7.43%		

TABLE THREE
ANALYTICAL RESULTS FROM ANALYSIS OF SOIL SAMPLES

	Background Maximums				Lake Soils Maximums			
	B2-E		B4-W		B1-E		B3-W	
	Total ug/g	EP Tox mg/l	Total ug/g	EP Tox mg/l	Total ug/g	EP Tox mg/l	Total ug/g	EP Tox mg/l
ARSENIC	17	0.011	25	0.009	24	0.010	25	0.005
BARIUM	200	0.35	380	2.9	130	0.99	3,500	1.3
BORON	60		150		120		80	
CADMIUM	0.9	0.007	0.5	0.006	0.6	0.003	0.7	0.003
CHLORIDE	580		1,300		1,100		1,900	
CHROMIUM	12	0.04	8.7	0.04	10	0.027	15	0.038
CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND
FLUORIDE	57		50		69		67	
HYDROCARBONS	130		38		3,300		360	
LEAD	7.8	0.007	6.7	0.007	9.2	0.018	10	0.01
MERCURY	0.10	0.0005	0.06	ND	0.13	0.0003	ND	ND
NITRATE	90		93		88		90	
TOTAL PHENOLICS	0.06		0.06		0.55		0.74	
SELENIUM	0.5	0.02	0.3	0.02	0.3	0.004	0.5	0.02
SILVER	2.8	0.034	3.4	0.043	1.9	0.049	2.7	0.031
SODIUM	1,100		510		480		1,000	
SULFATE	450		830		720		4,800	
TOC	0.36%		1.4%		0.63%		3.0%	

TABLE FOUR
ANALYTICAL RESULTS FOR GROUNDWATER
MONITORING WELL

	MWA	MWB	MWC	MWD	MWD duplicate	BLANK
(micrograms per liter)						
arsenic	ND	ND	ND	ND	ND	ND
selenium	ND	ND	ND	ND	ND	ND
mercury	ND	ND	ND	ND	ND	ND
boron	ND	149	ND	ND	ND	ND
barium	114	69	75	47	47	ND
cadmium	ND	ND	ND	ND	ND	ND
chromium	ND	ND	ND	ND	ND	ND
magnesium	69,100	72,510	125,000	63,370	64,040	355
silver	ND	ND	ND	ND	ND	ND
sodium	59,820	95,190	74,800	62,140	61,100	1204
phenol	5.4	6.6	<5	6.3	<5	14.3
(milligrams per liter)						
TOC	3.4	5.3	3.1	2.8	2.8	3.1
TDS	851	942	1,376	717	717	15
nitrate	1.92	3.6	5.44	5.7	2.59	0.27
chloride	157	224	322	91	88	1
fluoride	2.38	2.23	1.78	1.47	1.54	1.37
cyanide	all results were less than 0.02 milligrams per liter					<1
sulfate	*	109	246	132	137	
pH	7	7.04	6.91	6.9	6.9	6.2

* There was insufficient sample to run this analysis

Enforcement Activities

The site is now, and has been since its construction, owned by ATSF. ATSF is the only potentially responsible party (PRP). The investigations at the site have been conducted by ATSF under an Administrative Order on Consent with EPA.

Community Participation

Community concerns of either the area residents or local officials are very low. The site is fenced and visually obscured by growth. It is not in constant view or creating an immediate problem for the neighborhood. On August 18, 1988, EPA issued a press release and the Proposed Plan fact sheet. The press release was mailed to all news organizations in the Clovis/Lubbock/Amarillo area but there was no subsequent media coverage. The fact sheet was mailed to 175 residents and local officials. Extra copies of the fact sheet were provided to the four local repositories for display purposes.

In accordance with CERCLA, Section 117, both the press release and the fact sheet announced the comment period which ended September 9, 1988. A public meeting was held on August 23, 1988, in Clovis. Seven people attended the meeting. EPA's discussion did not generate any comments or questions and no written comments were received during the comment period.

Overall Site Strategy

This Record of Decision covers all the media of concern, including groundwater. One caveat is that the last round of groundwater sampling for the RI showed the presence of aliphatic hydrocarbons in one well. Three additional rounds of sampling were performed to determine if these hydrocarbons were present and if so, at what levels. Results from the first two of these additional sampling episodes did not show the hydrocarbon contaminants. If the results from the third round of sampling should show hydrocarbon contamination in the groundwater, some additional action may be necessary.

Description of Significant Changes in the Selected Remedy

There were no significant changes from the preferred remedy in the proposed plan and the remedy selected: Evaporation; onsite biodegradation; and in situ biodegradation followed by capping of the treatment area, long-term monitoring, and site access restrictions.

Description of Alternatives

Alternatives were examined for each of the three media in which significant contamination was discovered: Lake water, sediments, and soil.

LAKE WATER

1) No Action

For this alternative, no further remedial action would be taken for the lake water at the site, other than the construction of a security fence.

This alternative does not address any present or potential public health or environmental concerns presented by the current status of the lake water. Consideration of the "no action" alternative is a regulatory requirement, and it may be used as a baseline to which other alternatives may be compared.

2) Evaporation

This alternative, like all of the following alternatives for lake water remediation, involves a run-on control system encircling the contaminated soil area. This runon control system must be able to retain a 10-year storm event (3.5 inches of rainfall). Such a storm would produce approximately one inch of run-on from a drainage area of 1.27 square miles. In order to retain this run-on, a 4-foot deep ditch with a 20-foot wide bottom and 2:1 side slopes will be excavated. The soil excavated from the ditch will be used to construct a 4-foot high dike on the side of the ditch nearest the contaminated soil. The dike has an estimated length of 6000 feet.

Also included in this alternative is an evaporation system. In this system, the lake water will be pumped to an irrigator which will spray the water evenly over the 26 acre area within the dike. Using the average monthly evaporation rate for the Clovis area, pumping and spraying will need to continue for about two months in order to dry the lake. The residue deposited on the soil from the evaporated water will be remediated with the soils.

3) Spray Irrigation

This alternative will consist of pumping the lake water directly from the lake to nozzles or sprinklers spread out over the site outside the diked area. The water will undergo evaporation while any metals will be accumulated and organics degraded as in a land treatment system. It can be shown through comparison with food chain crop guidelines that the accumulation of metals will not be excessive. Food chain crop guidelines exist for arsenic, barium, cadmium, chromium, lead and mercury. Assuming that the water is sprayed out evenly over an area of 60 acres and all metals are evenly retained in the top 6 inches of soil, it can be shown that food chain crop guidelines exceed the accumulated concentrations by a factor of 200. Using an even more conservative approach, if all metals are retained in the top one inch of soil, this factor becomes 33. Control over residue from the application would be lost, however, as it would be spread over the irrigated area.

In addition to the actions detailed above, all lake water alternatives include the construction of a 6-foot high chain link fence with three strands of barbed wire around the entire 60 acre site.

Lake Sediments

1) No Action

For this alternative, no remedial action would be taken for the sediments at the site. This alternative does not address present or potential

public health or environmental concerns. This alternative will not be screened from consideration as it will serve as a baseline to which other alternatives may be compared.

2) In Situ Fixation (Fixation)

For this alternative, a lime-based solidifying agent such as fly ash will be added to the in-place sediments in the lake. This agent will be mixed vigorously with the sediments at specified water content. Water may need to be added or removed from the sediments to achieve the desired water content. Inspection will be necessary to determine if sufficient fixation has been achieved. Dust control and surface water diversion measures will be required throughout this operation to minimize wind-blown migration of contaminants and excessive surface water in the construction zone. The recommended method for dust control consists of regular spraying of the lake sediments with water.

3) Dredge, Onsite Biodegradation, Cap Treatment Area and Revegetate (Biodegradation)

This alternative will require that the sediments be dredged from the bottom of the lake, and then spread evenly over the ground in a designated land treatment area for biodegradation. After dredging the bottom of the lake, the dredged area will be revegetated. The land treatment area will be about 840 feet by 840 feet and be surrounded by 3-foot high dikes to minimize surface runoff. This area will be able to contain about one-third the total volume of sediments that need treatment at any one time. It is estimated that it will take from about 3 to 6 months to biodegrade each application of sediments; however, for the purpose of the feasibility study, it was assumed that each application would take one year to degrade. As a result, it is assumed that three years will be required to complete the biodegradation process. The sediments will be spread evenly for aerobic biodegradation, and will require monthly aerating and additions of nutrients to ensure uniform treatment. The progress of the biodegradation process will be monitored by periodic sampling of lysimeters installed at the land treatment area and soil corings. When it is determined that the sediments have been treated sufficiently, the biodegradation area will be capped. The cap will be sloped and have a PVC liner underlying a one-foot thick vegetated soil layer.

4) Dredge, Dewater, Fixation, Onsite Landfill (Landfill)

This alternative will require that the sediments be dredged from the bottom of the lake, and then stored and dewatered at the site. The dewatered sediments will then be mixed with a solidifying agent such as fly ash. Water may need to be added to or taken out of the sediments to achieve the desired water content. Inspection will be necessary to determine if sufficient fixation of the sediment has occurred. The solidified sediments will then be placed in a landfill built onsite. This landfill

will be designed with specifications similar to that of a RCRA landfill. The bottom of the landfill will be 500 feet by 500 feet. The depth will be 10 feet, with sides sloping at 2:1. The bottom will be double-lined with a leachate collection system and drainage net between the liner. After completion of landfilling the fixed materials, the landfill will be capped. The cap will be sloped and have a PVC liner underlying a one-foot soil layer which is vegetated. After closure, the landfill will be periodically inspected and maintained. After dredging the lake bottom is completed, it will be revegetated.

SOIL BELOW LAKE BOTTOM SEDIMENTS

1) No Action

For this alternative, no remedial action will be undertaken for the soil at the site. This alternative does not address public health or environmental concerns and also fails to meet SARA recommendations that the mobility, toxicity, or volume of contaminants be permanently or significantly reduced at the site. This alternative will not be screened from consideration as it will serve as a baseline to which other alternatives may be compared.

2) Cap, Grade & Revegetate (Capping)

For this alternative, the soil area of concern at the site will not be treated or moved. The soil will be covered in-place with a cap system consisting of an impermeable PVC liner covered with vegetated topsoil. The cap will be designed to minimize erosion and ponding.

3) In Situ Biodegradation

This alternative will not require removal of the soil of concern at the site. The soil will be left in place and aerated and blended with nutrients to promote biodegradation and, like all the biodegradation options, the progress of biodegradation will be monitored through lysimeter and soil sampling. Aeration will occur on a regular basis to ensure uniform treatment of the soils. The treatment area will be surrounded by runoff control system dikes which will minimize surface runoff. When it is determined that sufficient biodegradation has occurred, the area will be revegetated.

4) Excavate, Onsite Biodegradation, Cap Land Treatment Area & Revegetate Excavated Area (Onsite Biodegradation)

This alternative will require excavation of all soils of concern at the site. The excavated soils will be spread evenly over the ground in a designated land treatment area. The area will be approximately 640 feet by 640 feet and be able to handle one-third the volume of soils at any one time. It is anticipated that it will take about 3 to 6 months to treat an application of soils. However, for the purpose of this FS, it is conservatively assumed that it will take one year to biodegrade each application. As a result, it should take no more than three years to complete the biodegradation process. This land treatment area will be surrounded by 3-foot high dikes to prevent surface runoff. The contaminants

will be allowed to biodegrade aerobically in this area, and will be regularly aerated and blended with nutrients to ensure uniform treatment. The progress of biodegradation will be periodically monitored through lysimeter sampling and soil sampling. The land treatment area will be closed by capping when it is determined that sufficient biodegradation has occurred. The cap will be constructed of a PVC liner underlying vegetated topsoil. During construction, water spraying will be employed as a dust control measure at the site.

5) Excavate, Onsite Landfill (Landfill)

This alternative will require excavation of all soils of concern at the site. The excavated soils will be transferred to an onsite landfill as described in Alternative 4 under Sediments. The excavated area will be revegetated.

6) In Situ Fixation, Cap, Grade & Revegetate (Fixation)

This alternative will not require any removal of the soils of concern at the site. A solidifying agent such as fly ash will be added to the soil and mixed in. It may be necessary to add or remove water from the soil to achieve proper water content for solidification. Inspection will be necessary to determine if sufficient solidification has taken place. Upon completion, the solidified soil area will be capped with a PVC liner and topsoil and revegetated.

7) Excavate, Fixation, Onsite Landfill & Revegetate Excavated Area (Fixation and Landfill)

This alternative will require that the soils of concern at the site be excavated and removed. The excavated soils will be mixed with a solidifying agent at a prescribed water content. The mixture will be placed in a landfill excavated onsite and constructed similar to the landfill described in sediment Alternative 4. Inspections will be necessary to determine if sufficient solidification has taken place. The landfill will be capped and revegetated, and the excavated area will also be revegetated.

Comparative Analysis of Alternatives

Each alternative was evaluated on the following criteria:

1. Short-term effectiveness: Protection of human health and the environment during construction and implementation, including without limitation, the potential threat to human health and the environment associated with excavation, transportation, and redispisal or containment.
2. Long-term effectiveness and permanence: Effectiveness after construction and implementation is complete. This includes, without limitation, the long-term uncertainties associated with land disposal.
3. Reduction of toxicity, mobility, or volume: Anticipated performance

of the specified treatment technologies.

4. Implementability: Technical and administrative feasibility of alternatives and the availability of required resources.
5. Cost: Cost of construction and operation and maintenance including, without limitation, the potential for future replacement costs.
6. Compliance with ARARs: Compliance with applicable or relevant and appropriate requirements (abbreviated as ARARs) from existing laws and regulations. These are standards or regulations that either apply or at least should be considered when considering an alternative, including without limitation, the goals, objectives, and requirements of the Solid Waste Disposal Act.
7. Overall protection of human health and environment: How the alternative, as a whole, protects and maintains protection of human health and the environment.
8. State acceptance: The State's preferences or concerns about the alternatives.
9. Community acceptance: The community's preferences or concerns about the alternatives.

The following paragraphs will examine each of the alternatives for these criteria. For comparative purposes, satisfaction of the criteria will be rated as low, moderate, or high. These ratings are summarized in Table 5.

A. Short-term effectiveness

All three of the no action alternatives do not address existing conditions or potential threats to human health or the environment that will remain if no action is taken. The no action alternatives will, therefore, be rated as low.

When compared for protection of human health and the environment during implementation, the two lake water alternatives, evaporation and spray irrigation, involve use of similar equipment and little human contact with lake water is required by either. Evaporation enjoys a slight advantage as the area involved in receiving the water is smaller. Both alternatives are rated high for short-term effectiveness.

All three sediment alternatives, fixation, biodegradation and landfilling, involve disturbance of the sediments and accompanying production of dust. Dust control measures will be needed for all of these alternatives. With appropriate handling techniques and dust control measures, all three alternatives will have moderate short-term effectiveness.

For soils, capping will be the only alternative with a high short-term effectiveness, as it will involve little disturbance of the soils. All of the other soil alternatives involve extensive disturbance and handling of the soils and face the same dust problem discussed in the preceeding

TABLE FIVE

CRITERIA FOR SELECTION OF REMEDY

	Short-Term Effective- ness	Long-Term Effective- ness	Reduction of Toxicity, Mobil- ity or Volume	Implemen- tability	Cost	Compliance with ARARs	Overall Protec- tiveness
LAKE WATER							
No Action	Low	Low	Low	High	High	Low	Low
Evaporation	High	High	High	High	High	High	High
Spray Irrigation	High	Moderate	Moderate	High	Moderate	Moderate	High
SEDIMENTS							
No Action	Low	Low	Low	High	High	Low	Low
In situ Fixation	Moderate	Low	Moderate	High	Moderate	High	Moderate
Onsite	Moderate	High	High	Moderate	Moderate	High	High
Biodegradation	Moderate	Moderate	Moderate	High	Moderate	High	Moderate
Landfill	Moderate	Moderate	Moderate	High	Low	High	Moderate
Fixation & Landfill	Moderate	Moderate	Moderate	High	Moderate	High	Moderate
SOILS							
No Action	Low	Low	Low	High	High	Low	Low
Cap	High	Moderate	Moderate	High	Moderate	High	Moderate
In situ	Moderate	High	High	High	High	High	High
Biodegradation	Moderate	High	High	High	Moderate	High	High
Onsite	Moderate	Moderate	Moderate	High	Moderate	High	Moderate
Biodegradation	Moderate	Low	Moderate	High	Moderate	High	Moderate
Landfill	Moderate	Moderate	Moderate	High	Moderate	High	Moderate
In situ Fixation	Moderate	Moderate	Moderate	High	Moderate	High	Moderate
Fixation & Landfill	Moderate	Moderate	Moderate	High	Low	High	Moderate

Note: All of the alternatives are rated high for community acceptance as there was no comment in any of the alternatives.

paragraph for sediments.

B. Long-term effectiveness and Permanence

All three of the no action alternatives are rated low for long-term effectiveness as they do nothing to achieve adequate protection of human health and the environment or remove long-term threats from the contaminants by eliminating or mitigating the potential hazard to drinking water posed by contaminant migration.

Both active lake water remediation alternatives will eliminate the water. It is the fate of residue that differentiates the two. Spray irrigation will result in some permanence of residue disposal through biodegradation and the adsorption of metals onto soils. This, combined with elimination of the water, gives this option moderate long-term effectiveness. There would, however, be an increase the area in which the contaminants are located to include the entire quarter section of land, not just the lake bed. Evaporation will also eliminate the lake water, but will result in the residue being consolidated with the lake sediments. This will allow the residue from evaporation to undergo the same remediation as the sediments. Evaporation will, therefore, be rated high for long-term effectiveness.

Two of the three remaining sediment alternatives, fixation and landfilling, are essentially containment remedies. The sediment, if fixed in situ, would be vulnerable to deterioration through environmental effects. The presence of hydrocarbons in the sediments may also interfere with the permanence of fixation. Fixation will be rated low for long-term effectiveness. The landfill alternative will have a longer effective life than fixation, but all the contaminants will still be present and should the integrity of the landfill be breached in some manner, the material would be subject to the effects of the environment. Landfilling will be held as moderately effective in the long-term. Biodegradation offers the only permanent destruction of contaminants. The organics will be eliminated through biodegradation. The biodegradation option also has some of the benefits of landfilling as the sediments will be consolidated in the treatment area and capped after bioremediation. Biodegradation is considered highly effective in the long-term.

Soils fixation receives the same low rating as received for sediments. The capping and landfilling options would be moderately effective, but suffer finite useful lives because of degradation and failure of the containing materials. The combination of fixation and landfilling would result in greater long-term effectiveness than either alone, but again are rated moderate because of the possibility mentioned relating to landfilling in the preceding paragraph. The two biodegradation alternatives again offer permanent destruction of the primary contaminants. The difference between them is time for remediation and any benefits from the capping of the treated materials after bioremediation. Both biodegradation alternatives will be rated high for long-term effectiveness.

C. Reduction of Toxicity, Mobility or Volume

The three no action alternatives will be rated low as they do nothing to satisfy this criteria. Evaporation and spray irrigation will both reduce the mobility and volume of the lake water contaminants as the water will be eliminated and only the solid residue will remain. Spray irrigation would spread the residue throughout the irrigated area increasing the surface area of environmental effects which leads to migration (i.e., rainfall and leaching). Spray irrigation will be rated as moderate for this criteria. Evaporation within the lake bed will result in the residue being handled with the lake sediments. As the lake sediments will undergo further remediation to reduce toxicity and mobility of the contaminants, evaporation will be rated high.

For the sediments alternatives, fixation and landfilling will reduce the mobility of the contaminants through prevention of exposure to rainfall and leaching. However, both do little to reduce the toxicity of the contaminants; and fixation will increase the volume of contaminated material. Both will be rated only moderate. Biodegradation will reduce the mobility, toxicity and volume of contaminated material through elimination of the organic contaminants. As the treatment area will be outside the lake bed and will be capped following completion, mobility of the remaining contaminants will also be reduced. This option will, therefore, be rated as high.

The evaluation of soil alternatives for reduction of mobility, toxicity and volume is a repetition of that for sediments. The landfill and fixation alternatives will be rated as moderate and the biodegradation options as high. Capping will be rated as moderate as it does reduce mobility through the prevention of infiltration of groundwater.

D. Implementability

All of the proposed remedies use well tried and easily applied methods. There is little difference between them and all will be rated high for implementability with the exception of biodegradation for sediments which is rated moderate. This is not from difficulty of the techniques, but rather for the greater care which must be taken when applying biodegradation. Biodegradation will require greater monitoring during use and a longer time to implement than the other methods.

E. Cost

A summary of costs can be found in Table 6. Costs for each type of remediation are rated only against each other. Therefore, spray irrigation is rated moderate when compared to evaporation, and landfilling is rated moderate when compared to landfilling combined with fixation. Table 5 gives the ratings of the costs.

F. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Definition of which regulations are applicable or relevant and appropriate hinges on the nature of the contaminated material. Evaporation of the

TABLE SIX
ESTIMATED COSTS

	Direct Capital Costs	Operating & Maintenance Costs	Time Period
Lake Water			
No Action	\$ 142,000	\$ 0	0
Pumping, Evaporation & Disposal of Residue	378,000	10,000/mo.	2 mos.
Pumping & Spray Irrigation	511,000	10,000/mo.	2 mos.
Sediment			
No Action	\$ 0	\$ 0	0
In Situ Fixation	2,669,000	5,000/yr	Yrs 1 - 30
Dredge, On-Site Biodegradation, Cap Land Treatment Area & Revegetate Dredged Area	672,000	90,000/yr	Yrs 1 - 3
Dredge, Dewater, On-Site Landfill & Revegetate Dredged Area	2,351,000	2,000/yr	Yrs 4 - 30
Dredge, Dewater, Fixation, On-Site Landfill & Revegetate Dredged Area	5,020,000	7,000/yr	Yrs 1 - 30
Soil			
No Action	\$ 0	\$ 0	0
Cap, Grade & Revegetate		650,000	4,000/yr Yrs 1 - 30
In Situ Biodegradation & Revegetate	5,000	37,000/yr	Yr 1
		4,000/yr	Yrs 2 - 30
Excavate, On-Site Biodegradation, Cap Land Treatment Area & Revegetate Excavated Area	372,000	96,400/yr	Yrs 1 - 3
Excavate, On-Site Landfill & Revegetate Excavated Area	802,000	4,000/yr	Yrs 4 - 30
		9,000/yr	Yrs 1 - 30
In Situ Fixation, Cap, Grade & Revegetate	872,000	6,000/yr	Yrs 1 - 30
Excavate, Fixation, On-Site Landfill & Revegetate Excavated Area	1,464,000	9,000/yr	Yrs 1 - 30



water within the existing lake bed should pose no violation of any regulations as this is in fact what is now occurring naturally. Compliance with ARARs will be rated high.

Spray irrigation outside the lake bed could cause accumulation of salts in surface soils. New Mexico Water Quality Control Commission (NMWQCC) regulation standards for water used for irrigation would have to be met unless an exemption under NMWQCC Regulation 3-105.C for "irrigation for a period not to exceed five years for the revegetation of any disturbed land area" could be obtained.

The lake sediments do not invoke Resource Conservation and Recovery Act (RCRA) requirements as testing has shown they do not meet the characteristics of a RCRA waste, nor are they listed hazardous wastes. This includes the so called "land ban" restrictions. The RCRA regulations for handling hazardous wastes will be considered, however, in those cases where the proposed methods of remediation (land treatment, capping and landfilling) are similar to RCRA methods.

The contaminants are not volatile and should have no effect on air quality nor be governed by air regulations. The lake is an isolated body and is not covered by the National Pollutant Discharge Elimination System (NPDES) program or similar programs governing navigable waters.

G. Overall protection of human health and the environment

The major risks posed at this site come from the lake water, contaminated dust blowing offsite, and the potential for groundwater contamination. As long as the contaminated water, soils and sediments remain in place, these risks remain. Even without the inflow of water from the discontinued hopper car washing operation, the playa lake is the drainage point for this area, and the discharge water from the oil/water separator continues. The criteria by which overall protectiveness of the alternatives will be judged are the elimination of the presence of contaminated water, the threat of the migration of that water into the underlying aquifer, and elimination of the threat of migration of contaminants from the lake sediments and soils from infiltration of the overlying lake water or rainfall.

The three no action alternatives do nothing to remove these threats. They will be rated low. The two remaining lake water alternatives, evaporation and spray irrigation, both eliminate the lake water and are rated high.

For the sediments, in situ fixation would reduce the mobility of the contaminants, but would leave them in the lake bed where they could be released through breakdown of the fixed material. This alternative will be rated only moderate. The remaining alternatives would remove the contaminated sediments from the lake bed. Only biodegradation would permanently eliminate some of the contaminants. It will be rated high.

The other two alternatives will be rated moderate as their landfill components eventually will suffer environmental degradation. The soil alternatives will be rated similarly to the sediment alternatives. The two options which have biodegradation as a component will be rated high for overall protection and the four options which are basically physical containment will be rated as moderate.

H. State Acceptance

State preferences these center on a preference for active remediation leading to effective longterm remediation of the site.

I. Community Acceptance

There has been limited community interest in this site. No comments were received at the public meeting and no comments were received during the public comment period. Judging from the lack of comments or questions, it can be assumed that the community has no specific concerns or opposition to the remedy in the proposed plan.

Selected Remedy

The selected remedy has three main parts: Lake water-evaporation; sediments-dredge, onsite biodegradation, capping of the land treatment area, and revegetation; and soils - in situ biodegradation, capping of the land treatment area, and revegetation. The evaporation of lake water includes run-on controls. Access restrictions through a new fence are also required. The following is a more complete description.

A run-on control system consisting of a dike and ditch will be constructed around the circumference of the contaminated soils area. This 6,000 foot long dike will need to be constructed prior to the start of remedial action. Figure 3 shows a cross-section of the runon control ditch and dike. The construction of the system is expected to take two to three months. Other site preparation activities include erection of a 6-foot high chain link security fence with three strands of barbed wire around the site, and clearing of the land treatment and soil stock pile areas. These activities should take place during construction of the run-on control system.

A sprinkler system will be installed within the perimeter dike. Water will be pumped from the lake and sprayed over the contaminated soils within the dike to enhance evaporation of the lake water. This process is expected to take approximately two months, but may take longer if it takes place during a wet season.

The land treatment area, constructed for onsite biodegradation of the sediments, has been previously discussed. The soils will be excavated to a depth of 3 feet below the existing surface. The excavation will follow the natural slope of 2 percent. Dikes will be built around the perimeter of the area using the excavated soils. The dikes will be 5 feet high (above the existing ground surface) and have side slopes of 2-to-1. The soils excavated, but not used in dike construction, will be stock piled.

The sediments remaining on the lake bottom, after the lake water is removed, will be dredged and biodegraded at the land treatment area. The sediments will be placed in 12 inch layers within the diked land treatment area. Due to space limitations, the sediments will need to be treated in five layers. It is anticipated that each layer can be biodegraded in about 3 to 6 months; however, it is conservatively assumed that it will take one year for each layer. Thus, sediment biodegradation will take no more than five years. During the same time that the sediments are being treated, the soils will be biodegraded in situ. Soil treatment is expected to take no more than one year.

The next step will be implemented after the in situ biodegradation of the soils and onsite biodegradation of the sediment are complete. The biodegraded soil will be excavated and placed in the diked, onsite land treatment area used for the sediments after the fifth layer of sediments has been biodegraded. The soil layer will be sloped at 2 percent and covered with a PVC liner. The liner will be anchored in 2 foot deep trenches along the tops of the dikes. A one foot thick layer of soil (from the soil stockpile) will be placed over the liner and vegetated. Figure 4 shows the conceptual design of the capped land treatment area.

This moving of the soils to the onsite treatment area for closure essentially combines the important elements of the two highly rated soils alternatives (in situ Biodegradation, Cap Land Treatment Area and Revegetate Excavated Area). The prime advantage of this step is that all contaminants from the three areas of concern; lake water, lake sediment and affected soils, will have been degraded and subsequently contained within the onsite treatment area.

The areas from which the soils and sediments were excavated will be graded to remove any excessive slope changes resulting from excavation. In addition, the perimeter dike material will be used to fill in the ditch. The entire area will be revegetated and allowed to return to natural conditions.

No groundwater remediation is proposed, but groundwater monitoring will continue semi-annually during remediation and annually after remediation for the contaminants of concern for groundwater. Monitoring through lysimeters of the land treatment area will continue after closure on an annual basis.

During design of this alternative, tests will be performed to support assumptions made during the risk assessment regarding the speciation of chromium and the make up of the hydrocarbons in the lake sediments.

This remedy was selected based upon the satisfaction of the nine criteria shown most plainly in Table 6. In particular, the selected remedy satisfies the preference for permanent treatment, long-term effectiveness, overall protection of human health and the environment, and reduction of mobility and volume of contaminated materials.

FIGURE THREE
RUNON CONTROL

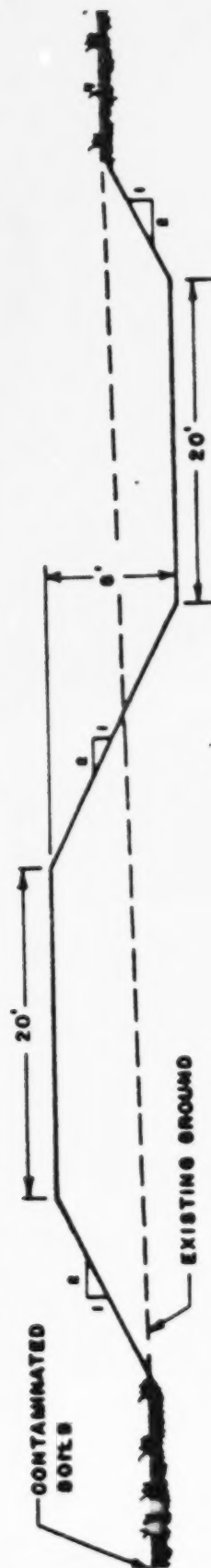
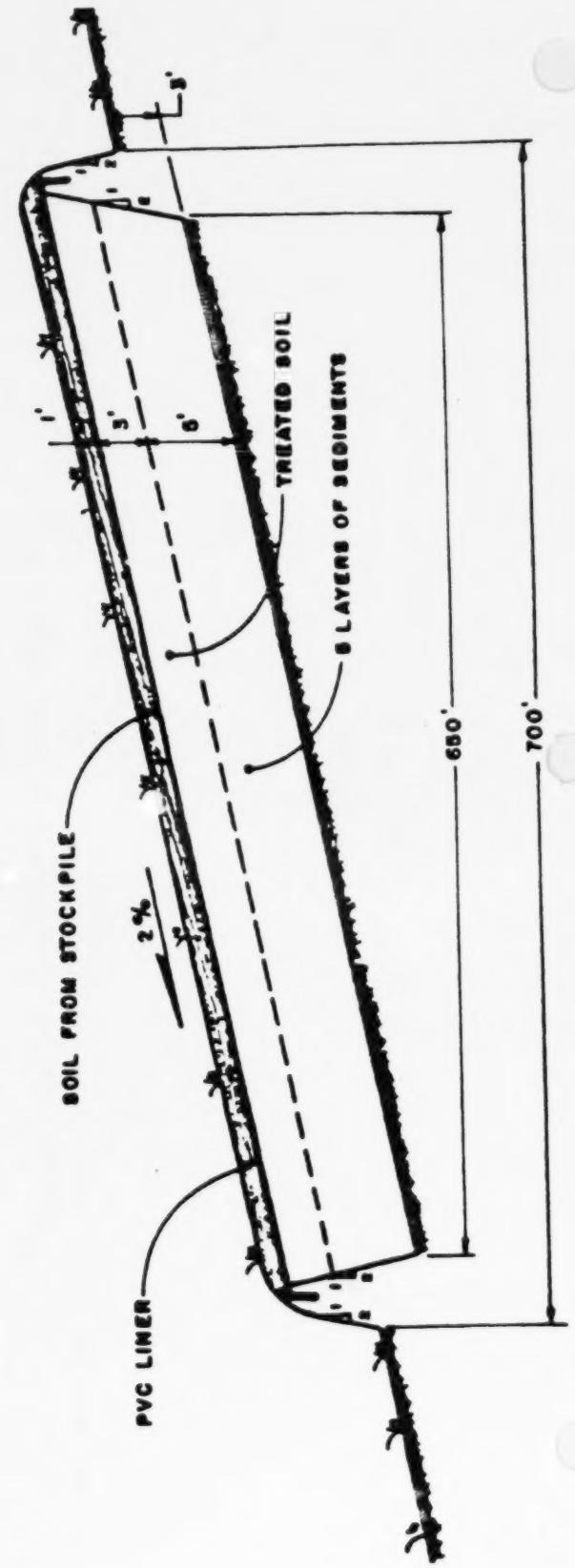


FIGURE FOUR
CROSS SECTION OF
LAND TREATMENT AREA AT
CLOSURE



No expected risk level from the implementation of the selected remedy was determined. The threats from the lake water and blowing dust will be eliminated. The potential for future contamination will have also been greatly reduced though this reduction cannot be quantified. The total estimated cost for the selected remedy are \$2,840,000.

Statutory Determinations

The selected remedy is protective of human health and the environment through the elimination of present and future risks posed by the site. The elimination of the lake water through evaporation, and of the opportunity for fugitive dust through capping of the treatment area, removes the current threat from the site. Future risks from the site through additional migration of contaminants are also eliminated through the permanent destruction of the organic materials through biodegradation and with the isolation of the remaining contaminants in the treatment area. The potential for migration of contaminants is also reduced through the elimination of the hydraulic head on the lake soils and sediments through evaporation of the lake water, through removal of the contaminated materials from the lake bed, and through the consolidation of the treated material in the onsite treatment area. No unacceptable short-term risks or cross media impacts will be caused by implementation of the remedy.

Few ARARs are actually applicable or relevant and appropriate to this site, as the materials in question are not RCRA wastes, the lake is not a navigable water of the United States nor is it connected to a flowing stream. The actions involved in the remedy are primarily aimed at preventing contamination of the groundwater aquifer under the site. The selected remedy will meet all primary State and Federal standards for drinking water. One State non-human health standard, that for chloride, is slightly exceeded in two monitoring wells, but these wells are immediately adjacent to the lake and well within the site boundaries. Chloride levels in the nearest wells used for human consumption are below the standard. The source of the chlorides is being removed from the lake bed. The property is owned by ATSF and no wells for consumption will be placed within site boundaries.

There are some guidelines that are in the category of "to be considered" guidance. The primary ones are those regulations regarding land treatment and will be used in monitoring the biodegradation area.

The selected remedy is cost-effective when its components are compared to alternatives which provide similar levels of overall effectiveness.

The selected remedy was picked from among the alternatives evaluated by the nine criteria as seen in Table Five. The selected remedy provides for elimination of the lake water and organic contaminants, and for the removal of the inorganic contaminants from the lake bed and their subsequent isolation. This is done in a cost-effective manner while giving the best long-term effectiveness through destruction of the organic contaminants. The elimination of the lake water and the destruction of the organic contaminants through biodegradation satisfies the preference for treatment that reduces toxicity, mobility or volume.

Responsiveness Summary

The responsiveness summary for this site can be found in Attachment 1.

ATTACHMENT ONE
STATE OF NEW MEXICO CONCURRENCE



NEW MEXICO
HEALTH AND ENVIRONMENT
DEPARTMENT

25

Post Office Box 988
Santa Fe, New Mexico 87504-0988

ENVIRONMENTAL IMPROVEMENT DIVISION

Richard Mitzelfelt
Director

GARREY CARRUTHERS
Governor

Carla Muth
Secretary

Michael J. Bur
Deputy Secretary

September 22, 1988

Allyn M. Davis, Director
Hazardous Waste Management Division (6H)
US Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

Dear Mr. Davis:

The State of New Mexico Environmental Improvement Division has reviewed the Draft Record of Decision for the ATSF (Santa Fe Lake) site in Clovis, New Mexico. EID concurs that the proposed remedy will adequately protect human health and the environment.

Sincerely,

Richard Mitzelfelt

RM:AC:dlr

xc: Doug Jones, EID Ground Water Section
Dave Tanner, EID Clovis Field Office

ATTACHMENT THREE
RESPONSIVENESS SUMMARY

Atchison, Topeka, and Santa Fe (ATSF) Clovis
Community Relations Responsiveness Summary

This Community Relations Responsiveness Summary has been prepared to provide written responses to comments submitted regarding the proposed plan of action at the Atchison, Topeka, and Santa Fe (ATSF) Clovis hazardous waste site. The summary is divided into two sections:

Section I: Background of Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during the remedial planning activities at the ATSF site.

Section II: Summary of Major Comments Received. The comments (both oral and written) are summarized and EPA's responses are provided.

I. Background of Community Involvement

Individual interest or attention to the contamination in Santa Fe Lake has been very low-key and unorganized. Since the lake itself is partially hidden by topography and growth, area residents seem to ignore it. The acreage is also fenced and locked which has reduced casual trespassing.

Press coverage of the site has been very limited and the majority of the articles were status oriented for all sites within the state.

EPA interviewed area citizens and local officials in August 1986. A project update regarding the status of the site was issued in September 1986. No concerns/questions were generated as a result of these two activities.

II. Summary of Major Comments Received

The press release and Proposed Plan fact sheet announcing the public comment period and public meeting were distributed on August 18, 1988. The comment period began on August 15 and ended September 9, 1988. A public meeting was held with area residents and local officials on August 23, 1988, at the Clovis Holiday Inn. The purpose of this meeting was to explain the results of the remedial investigation and to outline the various alternatives presented in the feasibility study. Eight people attended the meeting, but no oral statements or questions were asked. No additional written comments or questions were received.